MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015 / 2016

TRT3241- REAL-TIME SYSTEMS
(All sections / Groups)

29 February 2016

2.30 p.m. – 4.30 p.m.

(2 Hours)

INSTRUCTION TO STUDENTS

1. This examination paper consists of 3 pages (including the cover page) with 5 questions and solutions:
2. Answer **ANY FOUR** questions.
3. All questions carry equal weight (15 marks). The allocation of marks for each section within a question is given in the paper.
4. Write your answers in the answer booklet provided. Do not copy out the questions

Question 1

a) Briefly define the term "non-real-time systems. Using an appropriate example, show how it is differ from a real-time systems.

b) Name THREE common mechanisms for representing concurrent execution. Briefly describe each of its operation using appropriate diagram or pseudo code.

c) Briefly describe how atomic transaction is different than atomic action?

d) Briefly explain the difference between Asynchronous send, Synchronous send and Remote Invocation send operations in task synchronisation.

[3 + 6 + 3+ 3= 15 marks]

Question 2

a) Based on scenario given below, identify the type real-time task and briefly justify your answer.

Task handling a request for a seat reservation in a railway reservation application. Once a request for reservation is made, the response should occur within 20 seconds on the average. The response may either be in the form of a printed ticket or an apology message on account of unavailability of seats. Alternatively, we might state the constraint on the ticketing task as: At least in case of 95% of reservation requests, the ticket should be processed and printed in less than 20 seconds.

b) What is a safety-critical system? Give a few practical examples safety-critical hard real-time systems. Are all hard real-time systems safety-critical? If not, give at least one example of a hard real-time system that is not safety-critical.

c) Explain with the help of a schematic diagram how the recovery block scheme can be used to achieve fault- tolerance of real-time tasks. What are the shortcomings of this scheme? Explain situations where it can be satisfactorily be used and situations where it cannot be used.

[3+ 4 + 8 = 15 marks]

Continued...

Question 3

a) Explain scheduling point of a task scheduling algorithm? How the scheduling points are determined in (i) clock-driven, (ii) event-driven, (iii) hybrid schedulers?

b) What are the distinguishing characteristics of periodic, aperiodic and sporadic real-time tasks?

c) What is the difference between mutex and critical section?

d) A system can fail in many different ways. Briefly explain SIX classifications of failure modes.

[3+ 3+3 + 6 = 15 marks]

Question 4

a) Describe briefly the concept of dependability referring to a system.

b) Briefly describe SIX attributes of dependability.

c) Briefly explain how to achieve dependability in real-time systems.

[1 + 6 + 8 = 15 marks]

Question 5

a) Briefly describe TWO method applications use to access to time frame of its environment.

b) Briefly describe TWO types of delays function, write pseudo code to explain your answer.

c) Briefly describe how temporal scopes are used to facilitate the specification of the various timing constraints found in real-time applications.

[2 + 8 +5 = 15 marks]

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